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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of )

AMENDMENT OF PART 15 REGARDING )  
NEW REQUIREMENTS AND )  
MEASUREMENT GUIDELINES FOR )  
ACCESS BROADBAND OVER POWER )  
LINE SYSTEMS )

ET Docket No. 04-37

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To: The Commission

Federal Communications Commission  
Office of Secretary

**PETITION FOR ISSUANCE OF FURTHER  
NOTICE OF PROPOSED RULE MAKING AND  
FOR AMENDMENT OF REGULATIONS**

ARRL, the National Association for Amateur Radio ("ARRL"; also known as the American Radio Relay League, Incorporated), by counsel and pursuant to Section 1.401(a) of the Commission's rules [47 C.F.R. § 1.401(a)], hereby respectfully requests that the Commission issue without delay a *Further Notice of Proposed Rule Making* in this proceeding, proposing, in view of technical advancements in Access Broadband over Power Line (BPL) technology, amendment<sup>1</sup> of certain of the Commission's Part 15 rules, including Sections 15.601 *et seq.* (Subpart G) of the Commission's rules. The proposed amendments, together with existing Part 15 regulations, will for the first time address satisfactorily the serious interference potential of access BPL systems to licensed radio services, fixed and mobile. They will thus resolve unsettled but substantial interference issues in this docket proceeding, and will, when enacted, render moot

<sup>1</sup> Section 1.401(a) of the Commission's rules permits any interested person to petition for the issuance, amendment, or repeal of a rule or regulation by the filing of a petition for rulemaking.

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ARRL's pending and unadjudicated Petition for Reconsideration in this proceeding. As good cause for its Petition, ARRL states as follows:

## **I. Introduction**

1. The Commission released its *Report and Order* in this proceeding ["Carrier Current Systems, including Broadband over Power Line Systems," *Report and Order*, ET Docket No. 04-37, 19 F.C.C.R. 21,265 ("*Report and Order*")] on October 28, 2004. The *Report and Order* was published in the Federal Register January 7, 2005 (70 Fed. Reg. 1360) and became effective July 22, 2005 (See, 70 Fed. Reg. 56856). There were 17 Petitions for Reconsideration filed [See, the Public Notice 2694 (as corrected), released March 2, 2005], and numerous responsive pleadings thereto. None has been adjudicated as of the date of this Petition and all remain pending. Most of the Petitions for Reconsideration address the outstanding and extensively debated issue of interference to licensed radio services from BPL systems.<sup>2</sup> Notwithstanding the pendency of these Petitions for Reconsideration,<sup>3</sup> the effective date of the new FCC rules authorizing access BPL has passed, and access BPL systems which comply with the rules but which create substantial, ongoing interference to Amateur Radio stations are now being constructed and operated.<sup>4</sup>

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<sup>2</sup> See, e.g. the Petitions of ARRL; Donald G. Everist for Cohen, Dippell and Everist, P.C.; John L. Bartlett for Aeronautical Radio, Inc.; David L. Donovan for Association for Maximum Service Television, Inc., G. Scott Davis; W. Lee McVey, P.E.; Don Schellhardt for National Antenna Consortium and the Amherst Alliance; Steven E. Matda; and Cortland E. Richmond.

<sup>3</sup> Should the Commission adopt the rules proposed in this Petition, the action would render moot the issues raised in the ARRL's pending Petition for Reconsideration, and as such, ARRL would withdraw the latter.

<sup>4</sup> A good example of this is the Manassas, Virginia BPL system which former Commission Chairman Michael Powell visited for a press conference immediately prior to the Commission's Open Meeting at which the Access BPL rules were adopted. Manassas recently touted their success with BPL in press releases, but has ignored the fact that interference complaints have been pending and unresolved for more than a year in Manassas, as the Commission well knows. Despite the length of time that this issue has been pending, the Acting Chief, Office of Engineering and Technology has heretofore dismissed the complaints relative to the Manassas system by referring them back to the Manassas BPL system operator. OET

2. Nevertheless, since the Commission released the *Report and Order* in this proceeding, creating Part 15 regulations applicable to the operation of access BPL systems, the circumstances in portions of this nascent industry have changed somewhat. Several BPL system designs and implementation have demonstrated that it is technically and economically feasible to implement BPL without creating harmful interference to Amateur Radio operations. New access BPL technology has been introduced by Motorola, which makes no use of overhead medium voltage power lines, and which was carefully designed so as to preclude interference to Amateur Radio and other licensed services. As well, ARRL has had an opportunity, for the first time, to perform some tests and evaluations of certain other BPL architecture, including Current Technologies' systems. For several technical reasons, both the Motorola system and the Current Technologies systems can be operated without substantial risk of interference to Amateur Radio facilities. Although ARRL has not had an opportunity to closely examine the BPL systems using technology manufactured by IBEC, its architecture is similar to that of Current Technologies. Corridor Systems also is marketing a BPL system that would meet the additional requirements proposed herein. It is no longer the case that all BPL systems inherently radiate high levels of RF energy on Amateur allocations on overhead medium voltage power lines. Thus, not all BPL architectures have similar potential for harmful interference to the Amateur Radio Service (and to other licensed services). Some have inherently greater potential for interference, as currently configured, than others.

3. By stark contrast, those BPL systems, which have been tested in small field tests in various locations throughout the country, which use either DS2 chipsets or

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claimed that the parties at one early point "agreed on a plan of action", though the plan failed for lack of action by the BPL operator. Manassas uses the Main.net technology.

technology that makes use of HF spectrum (including Amateur allocations) on unshielded overhead medium-voltage power lines for signal transmission have caused numerous cases of harmful interference to stations in the Amateur Service. As detailed in ARRL's Petition for Reconsideration in this proceeding,<sup>5</sup> this has resulted, in field tests and deployments, in substantial, extremely difficult-to-resolve incidents of interference to fixed and mobile Amateur Radio facilities. The proximate cause of the interference is that the subject systems utilize HF bands on MV lines and they use Amateur Radio frequencies. The interference potential of these systems is unreasonably high and the Commission should not permit it to continue or expand. In virtually all cases, the interference either persists, or the system operator has ceased tests. The Commission has assisted not at all, or imperceptibly, in these cases, and the BPL system operator has either been uncooperative, or unable to resolve the interference.

4. There is now, before any significant deployment of BPL technology has commenced nationwide, an opportunity of limited duration to issue a *Further Notice of Proposed Rule Making* in this proceeding; examine the rules adopted in the *Report and Order* relative to the interference potential of various different alternative access BPL system architectures, and adopt certain amended regulations to limit the obvious interference potential by permitting the system architectures which adequately protect licensed radio services. The proposed additional regulations would permit those BPL

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<sup>5</sup> Exhibit D to the pending Reconsideration Petition is a listing of pending complaints from BPL system field tests or deployments, including Raleigh, North Carolina; Briarcliff Manor, New York; Cottonwood, Arizona; Cedar Rapids, Iowa; Cape Girardeau, Missouri, and Lee's Summit, Missouri.. Since the filing of the Petition for Reconsideration, there have been other incidents of interference from DS2 or Main.net BPL architecture systems, including Shelton, Connecticut and Manassas, Virginia, which continue unabated to the present time, despite interference complaints to the Commission and to the system operator extending over many, many months. Each of these systems complained of uses one of several systems: Mitsubishi, Amperion, Main.net, or Ambient.

architectures which are benign<sup>6</sup> [e.g. those not using HF on overhead lines and those using HF only on low-voltage (LV) wiring, with fixed, permanent notches in the Amateur bands, such as those using the HomePlug standard] and discourage the first generation, interference-causing BPL configurations (e.g. those using the present implementations of DS2 chipsets and the Main.net system architecture<sup>7</sup>) unless the latter modify their systems in certain minor respects.<sup>8</sup> As DS2 and Main.net systems can modify the operation of their systems using existing hardware and applications software, this is not a major burden on companies using their products and designs. The additional regulation suggested herein is timely and a reasonable means of accommodating BPL in a responsible manner, in view of the demonstrated interference potential of the early BPL system architecture, and the relative absence of such potential from certain newer BPL technologies and changed circumstances since the issuance of the Report and Order.

5. These new regulations, if adopted, would obviate the necessity to adjudicate ARRL's pending Petition for Reconsideration. It would remove regulatory uncertainty and allow access BPL to move forward unhindered by the interference problems that were inadequately addressed by the *Report and Order*. Either remedy would be

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<sup>6</sup> ARRL does not expect or anticipate the enactment of rules which would preclude all instances of access BPL interference to licensed radio services. The term "benign" in this instance means that the regulations would result in an RF environment in which predicted instances of interference are few enough that they can be addressed by the BPL provider or the Commission on a case-by-case basis. That is not the case with the present rules.

<sup>7</sup> DS2 chipset and Main.net technologies are capable of operating above 30 MHz on overhead wires and capable of notching all Amateur bands when used with LV wiring. The interference that is created by systems using these architectures are caused because the BPL manufacturers and operators do not use them in such a fashion. It is therefore completely unnecessary to choose among competing technologies.

<sup>8</sup> It is recognized that the *Report and Order* permitted essentially all types of access BPL architecture, and some planned BPL deployments would be delayed while the systems are re-engineered. A few existing deployments would be required to re-engineer. The Commission accommodated BPL systems in these categories in its Report and Order by permitting an 18-month period within which BPL systems had to come into compliance with the BPL rules adopted in the *Report and Order*. It may be necessary to start a new, shorter transition period upon the adoption of the additional and modified rules set forth in the attached Appendix.

consistent with Chairman Martin's recent testimony before the House Appropriations Committee on April 26, 2005 in which Chairman Martin assured the Committee that the Commission would reach an accommodation with Amateur Radio operators regarding BPL interference protection.

## **II. The HomePlug BPL Systems.**

6. ARRL was consulted by Motorola,<sup>9</sup> following issuance of the *BPL Report and Order*, during the development of Motorola's Powerline LV architecture, which incorporates Motorola's Canopy wireless broadband system. This system makes no use of medium-voltage power lines, and allows broadband connectivity through low-voltage lines from a transformer to homes and businesses. The subscriber module on the power pole captures the wireless broadband signal from a Canopy access point and relays it to a bridge connected to the transformer. Customers access the broadband signal through a HomePlug modem that plugs into an electrical outlet. This system also employs additional hardware filtering. The system was specifically designed in order to avoid radiated RF interference to Amateur Radio and other licensed services on high frequency (HF) and low band VHF bands. ARRL and Motorola have installed such a BPL test system located at ARRL headquarters. The system has performed adequately with no harmful interference to or from ARRL's co-located Amateur Radio station, W1AW.

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<sup>9</sup> Motorola approached ARRL in the Fall of 2004, asking for input on design implementations for BPL that would avoid the interference problems that have plagued other BPL test sites and early deployments. ARRL provided information to Motorola, which developed a system that Motorola and ARRL expected would be compatible with most Amateur Radio operation. ARRL was encouraged by Motorola's design choices, which include the avoidance of any use of overhead power lines and the use of HomePlug-compatible modems with Amateur allocations "notched out" on low-voltage wiring inside buildings. Motorola improved the HomePlug modems a step further by adding tunable hardware filters to deepen the notches and improve the immunity of the system to nearby radio transmitters in the process. This is a good example of the type of cooperation that the Commission should have encouraged (but did not) prior to adopting the wholly inadequate rules in the *Report and Order*.

7. Also since the release of the *Report and Order*, ARRL has had an opportunity to conduct some limited testing, not possible earlier,<sup>10</sup> of certain other HomePlug standard access BPL systems. Current Technologies' BPL deployments, for example, make no use of Amateur bands (save for the several frequencies at 5 MHz), nor does that architecture make use of MV lines for transmission of HF signals. The limited testing of deployments of HomePlug standard architecture, especially in Cincinnati, Ohio, has indicated that the interference potential of those systems, because of the characteristics mentioned above, is minimal relative to Amateur Radio facilities.

8. The characteristics that these two architectures have in common are:

(1) With fixed, permanent notches, they make no use of Amateur bands (save for the 5 MHz channels in the case of the HomePlug standard systems, which is a manageable problem<sup>11</sup>); and

(2) They make no use of MV power lines for HF signal transmission.

In ARRL's view, these two characteristics differentiate the HomePlug standard architectures, typified by, as examples, Motorola, Corridor Systems, IBEC and Current Technologies systems, from the other systems in use today, including those using DS2 chipsets and other spread-spectrum implementations, including the Main.net architecture.

9. This is not to say that the use of HomePlug modems is the ultimate solution to the BPL interference problem, or that the DS2 chipsets, regardless of the abysmal interference "track record" that BPL companies which employ DS2 technology have exhibited to date. **In essence, the real divide is that companies such as Motorola, Current Technologies, IBEC and Corridor Systems all have designs that do not use HF at all on overhead power lines and they avoid the use of Amateur Radio**

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<sup>10</sup> BPL manufacturers have, until recently, typically kept the location of their trials confidential.

<sup>11</sup> It is hoped that future HomePlug systems will avoid use of the 5 MHz Amateur allocation as well.

**spectrum in all parts of their system (other than the 5 MHz channel issue referenced above).** The non-interfering BPL systems all happen to use HomePlug modems in their design, but the reason interference to Amateur Radio is avoided is not related directly to the HomePlug technology *per se*. Rather, it is that HomePlug's notching is "fixed": the Amateur bands simply are not used anywhere, any of the time. The notching inadequacies of the HomePlug modems would presumably be similar to those of the DS2 type modems, if HomePlug modems were used on overhead, medium voltage lines. Thus, it is the combination of the use of HomePlug modems and the avoidance of use of spectrum in use near the HomePlug spectral mask on overhead lines that differentiates the technologies. By contrast, and as explained further below, it is not the DS2 chipsets which are flawed, but rather the implementation of them, because the notches are not fixed, but are programmable, and the companies using DS2 technology use HF on overhead MV lines, including Amateur bands.

10. The DS2 and Main.net systems, in ARRL's extensive experience, not inherently but *in their deployed configurations*, have overwhelming interference potential, including interference potential to mobile radio facilities. Mobile facilities *must* be protected, if at all, by the system architecture *ab initio*, rather than by means of any post-interference resolution or mitigation techniques. Mobile stations cannot be protected by the band-aid approaches contained in the *Report and Order*. ARRL's position is that the DS2 and Main.net systems as deployed in present system architecture cannot and should not be deployed on MV lines, but the rules adopted in the *Report and Order* permit such deployment. They have been demonstrated to be a substantial interference



generator and the willingness or ability of the system operators using this architecture to address interference when complained of, has been woefully lacking.<sup>12</sup>

11. In addition to the foregoing, The Commission should remedy a serious error in the "Guidelines" portion of the *Report and Order* (Appendix C) with respect to measurement techniques. ARRL has, in its Citation of Additional Authority filed in this proceeding July 8, 2005, established beyond any reasonable doubt the inappropriateness of use of a 40 dB/decade signal decay extrapolation factor for HF BPL systems, and the appropriateness instead of a 20 dB/decade extrapolation factor. This is a critical element in avoiding interference to licensed radio services, for reasons already offered to the Commission by ARRL.

12. Prior to the issuance of the *Report and Order*, ARRL had urged that the radiated emission limits for BPL, which are the same as the limits applicable to point-source radiators, should be reduced. That is an alternative to the adoption of the proper 20 dB per decade extrapolation factor, and it could be a partial solution to the BPL interference problem, though reduction of the radiated emission maxima is *not* proposed herein. The point is that there are tradeoffs possible. The following table is ITU-T Recommendation K.60-2003, "*Emission limits and test methods for telecommunication networks*." This internationally recognized Recommendation is voluntary. The

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<sup>12</sup> As discussed above, the DS2 notching and the HomePlug notching are similar. However, all of the companies using the DS2 modems have two characteristics that make the implementation highly problematic for over-the-air radio services, in particular the Amateur Service: (1) they do not avoid Amateur allocations in all of their deployment and the notching they do is generally inadequate to keep their emissions below the ambient noise level because they operate on HF bands, with some notches, on overhead lines. If companies employing the DS2 modems all operated between 30 and 50 MHz on overhead lines and used the HF spectrum with notches only on Low Voltage wiring, they would be in the same category as, for example, Current Technologies system deployed in Cincinnati, Ohio, which is relatively benign toward Amateur Radio.

recommended radiated emission levels are well below current Part 15 limits applicable to BPL:

**Table 1/K.60 – Target limits for unwanted disturbance emissions from telecommunication networks measured *in situ***

Frequency range (MHz)	Field strength limit [dB $\mu$ V/m]		Standard measurement distance	Measurement bandwidth
	PEAK	Quasi Peak		
0.009 to 0.15	$52 - 20 \cdot \log(f[\text{MHz}])$	$40 - 20 \cdot \log(f[\text{MHz}])$	3 m	200 Hz
0.15 to 1	$52 - 20 \cdot \log(f[\text{MHz}])$	$40 - 20 \cdot \log(f[\text{MHz}])$	3 m	9 kHz
1 to 30	$52 - 8.8 \cdot \log(f[\text{MHz}])$	$40 - 8.8 \cdot \log(f[\text{MHz}])$	3 m	9 kHz
30 to 230	40 (Note 3)	40	3 m	120 kHz
230-1000	47 (Note 3)	47	3 m	120 kHz
1000 to 3000	74	n.a.	3 m	1 MHz
<p>NOTE 1 – For the purposes of this Recommendation, the limits are specified in terms of electric field strength. In the frequency range below 30 MHz these limits also apply, if necessary, formally converted by means of the free space wave propagation impedance of 377 <math>\Omega</math>, to the magnetic field strength measured in accordance with 7.3.</p> <p>NOTE 2 – The limits are given in PEAK because the measurement time is reduced. If the background noise is too high, a measurement with a quasi-peak receiver has to be performed and only the QUASI-PEAK limit applies. Above 1 GHz, no QP receiver exists and only a PEAK measurement has to be performed.</p> <p>NOTE 3 – If the conversion factor between PEAK and QUASI-PEAK is known, the limit can be increased by this factor.</p> <p>NOTE 4 – At the transition frequency, the lower level applies.</p>				

It is noted that the limits in this recommendation are specified at 3 meters distance from the line, not 30 meters. They also, appropriately, vary with frequency. If the Commission was to adopt the foregoing standards for maximum radiated emissions from BPL systems, but did not change the inapplicable 40 dB/decade extrapolation factor in the Guidelines for measuring BPL systems, then the following limits would apply (using certain Amateur HF bands as examples):

Frequency	3m limit	Extrapolated to 30m (40 dB/decade)
3.5 MHz	35.2 dBuV/m	-4.8 dBuV/m
14 MHz	29.9 dBuV/m	-10.1 dBuV/m
28 MHz	27.3 dBuV/m	-12.7 dBuV/m

If the above radiated emission levels, and a 20 dB/decade distance extrapolation factor was adopted, then the following limits would apply (again, using certain Amateur HF bands as examples):

Frequency	3m limit	Extrapolated to 30m (20 dB/decade)
3.5 MHz	35.2 dBuV/m	15.2 dBuV/m
14 MHz	29.9 dBuV/m	9.9 dBuV/m
28 MHz	27.3 dBuV/m	7.3 dBuV/m

13. If the internationally determined limits at 30 meters as shown above were to be applied to BPL systems and no change was made in the 40 dB/decade extrapolation factor, those reduced radiated emission limits coupled with the present notching technology (if applied consistently and required for the entirety of all Amateur allocations) would be adequate to protect mobile Amateur stations. If the radiated emission limits now permitted for BPL systems in the current rules were to be combined with the applicable 20 dB/decade extrapolation for measurements, the combination would also solve the BPL mobile interference problem, when combined with state of the art, fixed notching and avoidance of use of HF bands on MV lines. It is inescapable that the electromagnetic compatibility aspects of BPL require a correct combination of radiated emission limits; signal decay distance extrapolation; and state of the art adherence to good engineering practice (which presently requires the avoidance of HF on overhead

MV lines, and fixed notching of Amateur allocations).<sup>13</sup> The Commission's rules should require an appropriate combination. ARRL's previously submitted material demonstrates clearly that for overhead power lines, using computer models provided by NTIA and models of overhead wiring as described by the electric utility industry in their submissions in the proceeding, a 20 dB/decade factor accurately predicts the field strength at upward angles at a distance of 30 meters from safe measurements made at 1 meter in height,<sup>14</sup> 10 meters from an overhead power line. Of significance, the simple change in the rules of using the proper distance extrapolation, along with currently available BPL notching technology and the avoidance of HF<sup>15</sup> on overhead lines could, if mandated, protect mobile operation in the Amateur Service, and protect most fixed station operation as well. At the present time, the Section 15.615 regulations require none of these elements. Radio Amateurs would accept a combination of revised radiated limits and an appropriate distance extrapolation factor that resulted in adequate protection for radio services, coupled with appropriate notching of all portions of all Amateur

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<sup>13</sup> Another variable, changes in which are, again, **not** proposed herein, is notching depth. The present rules require 20 dB of notching of HF signals and 10 dB at VHF. This is wholly inadequate to protect Amateur radio receivers from interference at present radiated emission limits and distance extrapolation. Motorola has demonstrated that it is technically (and apparently economically) feasible to notch to a considerably greater depth than is required by present rules. While the state of the art of the DSP used to generate BPL signals offers notch depth of approximately 25 dB. However, state of the art of unfiltered radio transmitters is about the same, and the rules for virtually all radio services require additional filtering. The Commission could require BPL systems to operate at a minimum of -35 dB in any notched spectrum. This could only be achieved with additional hardware filters. The major benefit to BPL systems is that, as demonstrated at ARRL Headquarters in Connecticut with the Motorola system, the combination of OFDM notching of the Amateur bands and additional filtering provided a remarkable degree of immunity of the BPL system to transmitted Amateur Radio signals in the same spectrum. Data rates were found to be unaffected when the W1AW station transmitted on a high duty cycle at up to 1 kW of transmitter power output on 8 different Amateur bands.

<sup>14</sup> The proper determination and control of energy radiated upward from overhead power lines is essential to protect nearby antennas that are typically located at heights greater than the power lines. In addition, NTIA has conducted studies that show the effect of the aggregate of BPL emitters by skywave emissions. If these studies are valid, it is important that the upward angles of emission from power lines be accurately determined.

<sup>15</sup> Of note, the noise levels from other devices connected to power lines are usually much lower on VHF than it is on HF, so the use of 30-50 MHz on overhead lines for BPL generally allows it to function better.

allocations, and the non-use of HF on MV lines. However, the Commission's *Report and Order* indicated a reluctance to modify the radiated emission limits for BPL systems. Accordingly, this petition merely proposes the adoption of the proper distance extrapolation factor, non-use of MV lines for HF transmission, and complete, full-time notching of Amateur allocations.

### **III. Proposed Additional Rules**

14. In view of the newly developed (or newly tested) BPL technologies, and in view of the vast differences in interference potential between the HomePlug standard architectures as configured on the one hand, and the DS2 and Main.net architectures as presently configured on the other, ascertained by extensive field investigations and extensive analysis, ARRL proposes the adoption of certain additional rules in the attached Appendix. Adoption of these rules will lead to a reasonable accommodation for access BPL (i.e. a solution that allows BPL systems with benign architecture to be deployed), and the protection of Amateur Radio and other stations, including those Public Safety mobile facilities utilizing low-band VHF, to the extent that any residual interference instances will be sufficiently few that they can be dealt with on a case-by-case basis, if necessary by the Commission's Enforcement Bureau.

15. The following three elements, should be added to the BPL rules adopted in the *Report and Order*:

(a) All access BPL systems would be prohibited from utilizing Amateur Radio allocations (except the discrete 5 MHz channels which are not excluded from the current HomePlug systems) in their system architecture;

(b) All access BPL systems would be prohibited from using HF bands on medium voltage power lines; and

(c) Signal decay from access BPL systems will be measured using a 20 dB/decade extrapolation factor, rather than the inapplicable 40 dB/decade extrapolation factor.

Each of these three elements is necessary,<sup>16</sup> and all three are sufficient, to resolve all issues that ARRL and the Amateur Service have with authorizing Access BPL generally. It is assumed that, upon adoption of these additional rules, BPL equipment manufacturers and service providers other than those several companies already meeting the criteria, will reconfigure the architecture of their systems to permit them to compete with the companies already meeting the specifications. To ARRL's knowledge, all present BPL architectures will be able, after a reasonable transition period, to meet the proposed additional BPL rules. None of the foregoing additional requirements would necessitate extensive system redesign, save for the need for additional filtering. Ad hoc filtering is required by every licensed radio service, so this cannot be suggested to be a substantial burden on system manufacturers or operators. Nor can it be said to be an unreasonable burden to exclude Amateur Radio allocations, since *Current Technologies*, *Motorola*, *IBEC* and *Corridor Systems* all avoid use of Amateur allocations as a matter of design, and all DS2 and other BPL systems are capable of implementing such a requirement. In fact, a majority of the installed BPL equipment now does not use Amateur allocations, and no system that has started operation not using Amateur allocations has received any formal interference complaints. In addition, some companies have demonstrated that it is not only possible technically to meet the rules proposed, but also that doing so provides a

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<sup>16</sup> Use of a 20 dB/decade extrapolation factor is not sufficient alone, but it is necessary. That additional requirement would provide approximately 10 dB of interference protection, which would not be sufficient as a practical matter. Coupled with fixed notching of Amateur allocations, however, which would add approximately 25-30 dB of attenuation (as an example), this would usually provide adequate BPL radiated emission reduction to protect mobile Amateur Radio facilities.

more robust product that meets the Commission's stated dual intention: to accommodate BPL as an additional, competitive broadband option while protecting licensed radio services. The present BPL rules achieve the first of the goals, but they are woefully inadequate to meet the second. The proposed additions allow achievement of both goals simultaneously.

#### **IV. Conclusion.**

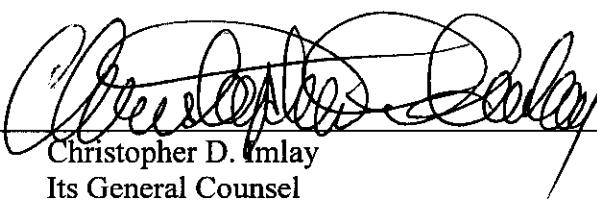
16. Issuance of a *Further Notice of Proposed Rule Making* incorporating the above proposals would be entirely consistent with the Commission's goals in Docket 04-37. It would allow the more than 650,000 licensees in the Amateur Radio service to support the rollout of benign access BPL in the United States, and it would avoid epidemic levels of BPL interference complaints filed with the Commission, which the Commission's Enforcement Bureau is inadequately staffed to handle. The *Report and Order* in this proceeding was insufficient to protect licensed radio services from interference, and the record in this proceeding amply demonstrates that. The Commission has a very short window of opportunity right now to fix that problem, before any significant access BPL deployment has occurred, courtesy of a portion of the BPL industry itself, which has demonstrated that there are architectures which can protect the Amateur Radio service, a geographically proximate neighbor, from the interference that is inevitably caused to fixed and mobile Amateur stations from the DS2 and Main.net architectures *as presently deployed*. It is the Commission's obligation to recognize and utilize this opportunity, and to amend its rules to protect licensed radio services for the first time in this proceeding. It can be done without significant system redesign by any

BPL provider, and the Commission can easily accommodate the transition by re-starting the 180-day compliance period established in the *Report and Order*.

Therefore, the foregoing considered, ARRL, the National Association for Amateur Radio, respectfully requests that the Commission issue a Further Notice of Proposed Rule Making in this proceeding, incorporating the additional and amended rules discussed above, and as set forth in the Attached Appendix.

Respectfully submitted,

**ARRL, THE NATIONAL ASSOCIATION FOR  
AMATEUR RADIO**

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October 18, 2005



## APPENDIX A

Title 47 of the Code of Federal Regulations, Part 15, is amended as follows:

1. Section 15.3 is amended by adding paragraphs (ff) and (gg) to read as follows:

Section 15.3 Definitions.

\* \* \* \* \*

(ff) Access Broadband over Power Line (Access BPL). A carrier current system installed and operated on an electric utility service as an unintentional radiator that sends radio frequency energy on frequencies between 30 MHz and 80 MHz over medium voltage lines or on frequencies between 1.705 MHz and 80 MHz over low voltage lines to provide broadband communications and is located on the supply side of the utility service's points of interconnection with customer premises. Access BPL does not include power line carrier systems as defined in Section 15.3(t) of this part or In-House BPL as defined in Section 15.3(gg) of this part.

2. Section 15.37 is amended to read as follows:

Section 15.37 Transition provisions for compliance with the rules.

\* \* \* \* \*

(l) All Access BPL devices that are manufactured, imported, marketed or installed on or after ***[insert date 18 months from date of publication of Second Report and Order in the Federal Register]*** shall comply with the requirements specified in subpart G of this part, including certification of the equipment.

3. Part 15 is amended to read as follows:

### **SUBPART G – ACCESS BROADBAND OVER POWER LINE (Access BPL)**

Section 15.601 Scope.

This subpart sets out the regulations for Access Broadband over Power Line (Access BPL) devices operating in the 30-80 MHz band over medium voltage lines, or in the 1.705-80 MHz band over low voltage lines.

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Section 15.611 General technical requirements.

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(b) Radiated emission limits

(1) Access BPL systems that operate in the frequency range above 30 MHz over medium voltage power lines shall comply with the radiated emission limits provided in Section 15.109(b) of this part.

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(c) Interference Mitigation and Avoidance.

(1) Access BPL systems shall deploy adaptive interference mitigation techniques to remotely reduce power and adjust operating frequencies, in order to avoid site-specific, local use of the same spectrum by licensed services. These techniques may include adaptive or “notch” filtering, or complete avoidance of frequencies, or bands of frequencies, locally used by licensed radio operations.

(i) For frequencies below 30 MHz on low voltage lines, when a notch filter is used to avoid interference to a specific frequency band, the Access BPL system shall be capable of attenuating emissions within that band to a level at least 20 dB below the applicable Part 15 limits.

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Section 15.615 General administrative requirements.

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(f) *Federal government spectrum users and other radio service users.* An entity operating an Access BPL system shall ensure that, within its Access BPL deployment area, its system does not operate on any frequencies designated as excluded bands or on identified frequencies within any designated exclusion zones.

(1) *Excluded Bands (medium voltage power lines).* To protect Aeronautical (land) stations, aircraft receivers, and geographically proximate licensed radio service stations, Access BPL operations using medium voltage power lines are prohibited in the frequency bands listed in Table 1. Specifically, such BPL systems shall not place carrier frequencies in these bands.

**Table 1. Excluded Frequency Bands**

<b>FREQUENCY BAND</b>
1.800 – 30 MHz
50.0 – 54.0 MHz
74.8 – 75.2 MHz

(2) *Excluded Bands (Low Voltage Power Lines and In-Home BPL systems)*. To protect geographically proximate licensed radio service stations, Access BPL operations using low voltage power lines, and In-Home BPL systems are prohibited in the frequency bands listed in Table 2. Specifically, such BPL systems shall not place carrier frequencies in these bands.

**Table 2. Excluded Frequency Bands**

<b>FREQUENCY BAND</b>
1.800 – 2.0 MHz
3.50-4.0 MHz
7.00-7.30 MHz
10.10-10.15 MHz
14.0-14.35 MHz
18.068-18.168 MHz
21.00-21.45 MHz
24.89-24.99 MHz
28.00-29.70 MHz
50.0 – 54.0 MHz

[Note: the rules governing exclusion zones, including all references to Coast Guard coast facilities and Maritime Public Coast stations would be modified to remove references to bands between 1.8 and 30 MHz.]

The Guidelines for measurement of access BPL emissions are revised to read as follows:

#### **GUIDELINES**

##### **Measurement Guidelines for Broadband Over Power Line (BPL) Devices Or Carrier Current Systems (CCS) and Certification Requirements For Access BPL Devices**

This appendix is intended to provide general guidance for compliance measurements of Broadband over power line (BPL) devices and other carrier current systems (CCS). For BPL systems, the measurement principles are based on the Commission's current understanding of BPL technology. Modifications may be necessary as measurement experience is gained.

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#### **1. General Measurement Principles for Access BPL, In-House BPL and CCS**

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**b: Radiated Emissions Measurement Principles for Overhead Line Installations**

- 1) Measurements should normally be performed at a horizontal separation distance of 10 meters from the overhead line. If necessary, due to ambient emissions, measurements may be performed a distance of 3 meters. Distance corrections are to be made in accordance with Section 15.31(f)(1) of the Rules, regardless of frequency range.

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**3. In-House BPL and Carrier Current Systems Measurement Principles**

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**b. Additional Measurement Principles for *In-Situ* Testing With Overhead Lines**

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- 2) Measurements should normally be performed at a separation distance of 10 meters from the building perimeter. If necessary, due to ambient emissions, measurements may be performed a distance of 3 meters. Distance corrections are to be made in accordance with Section 15.31(f)(1) of the Rules, regardless of frequency range.
- 3) The distance correction for the overhead-line measurements shall be based on the slant range distance, which is the line-of-sight distance from the measurement antenna to the overhead line. Slant range distance corrections are to be made in accordance with Section 15.31(f) of the Rules.